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(54) CLOSING AND SEALING CONTAINERS  
 SUCH AS BOTTLES AND JARS

(71) We, METAL BOX LIMITED, a Company Incorporated under the laws of Great Britain, of Queens House, Forbury Road, Reading, RG1 3JH, formerly known as THE METAL BOX COMPANY LIMITED, of 37, Baker Street, London W1A 1AN, England, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to closing and sealing containers such as bottles and jars having a screw-threaded or beaded portion adjacent to the mouth thereof.

A container of the said kind is often closed and sealed by a cap which comprises a crown and an annular skirt made of deformable material and which includes a plastisol sealing compound engageable with and around the mouth of the container. The contents of a container sometimes require that the container be pasteurised and this is done at an elevated temperature after the container has been filled, closed and sealed. Heretofore, it has been found that during pasteurising there is, with caps including a plastisol sealing compound, a tendency for leakage to occur due to venting of the closed container at the elevated temperature and it is an object of the present invention to provide a process and apparatus for preparing for pasteurisation packs comprising containers and caps of the kind described above so as to avoid venting during pasteurisation of the packs.

According to one aspect of the invention there is provided a process for closing and sealing for pasteurisation a pack including a container such as a bottle or jar having a screw-threaded or beaded portion adjacent to the mouth thereof, and a cap which is made of permanently deformable material and comprises a crown and an annular skirt, and within the cap a plastisol

sealing compound arranged to be engageable with and around the mouth of the container, said process comprising the steps of:—

- (a) heating the plastisol sealing compound in the cap to a temperature below the melting point of the plastisol sealing compound but in excess of the temperature at which the pack is to be pasteurised by feeding the cap through a chute heated lengthwise thereof to or substantially to the position at which the cap leaves the chute,
- (b) allowing the heated cap to pass from the chute and to be loosely applied about the mouth of the container,
- (c) causing the heated plastisol sealing compound to form seals with the outer and top faces of the mouth end of the container by applying pressure to the crown of the loosely applied cap, and
- (d) deforming the skirt of the cap to effect mechanical engagement of the cap with the screw-threaded or beaded portion of the container.

According to another aspect of the invention there is provided apparatus for closing and sealing for pasteurisation packs each including a container such as a bottle or jar having a screw-threaded or beaded portion adjacent to the mouth thereof, and a cap which is made of permanently deformable material and comprises a crown and an annular skirt, and within the cap a plastisol sealing compound arranged to be engageable with and around the mouth of the container, said apparatus comprising

- (a) a chute arranged to deliver caps one at a time to a position at which they pass from the chute and are loosely applied to the mouths of the containers,
- (b) a channel arranged to deliver the

- caps to the chute from a hopper,
- (c) heater means which extend lengthwise of the chute from the position at which caps enter the chute to the position at which the caps leave the chute and which are arranged to heat the chute to an extent such that when the caps leave the chute the plastisol sealing compound in the caps is heated to a temperature which is below the melting point of the compound but is in excess of that at which the packs are to be pasteurised,
- (d) means operable to apply pressure to the crowns of the caps loosely applied to containers thereby to cause the heated compound in the caps to form seals with the outer and top faces of the mouths of the containers, and
- (e) means operable to deform the skirts of the caps applied to the containers to effect mechanical engagement of the skirts with the screw-threaded or beaded portions of the containers.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 illustrates, partly in section, one form of cap for closing and sealing a container,

Figs. 2 and 3 illustrate the mode of closing the cap of Fig. 1,

Fig. 4 illustrates the neck of the bottle with the cap closing and sealing the mouth thereof, and

Fig. 5 is a pictorial view of apparatus for feeding caps to a machine for closing and sealing the necks of bottles in the manner illustrated in Figs. 2 and 3.

Containers may in accordance with the invention be closed and sealed by any suitable form of cap which includes a plastisol sealing compound but the cap which has been found to be most suitable is a known kind of cap as illustrated in Fig. 1 of the drawings. This cap is made of permanently deformable material such as tinplate or aluminium and comprises a crown 1 and an annular skirt which has a first portion 2 which extends from the open end of the cap and has a diameter greater than that of the maximum permissible diameter of the screw-threaded portion 3 of the neck 4, Figs. 2 and 3, of a bottle the mouth of which is to be closed and sealed by the cap. The skirt also includes a second portion 5 which extends from the crown 1 and the diameter of which is less than that of the first portion 2 and internally corresponds substantially with the minimum permissible diameter for the mouth end of the neck 4. The first portion 2 of the skirt is

provided at 6 with an irregular exterior adjacent to the junction of the first portion with the second portion 5. The irregular part 6 may be formed in any desired manner, as by profiling or knurling, and is arranged to strengthen the skirt and to provide a gripping surface by which the cap can be gripped when being turned to remove it from a neck to which it has been applied.

The interior of the cap in the region thereof which overlies the mouth end of the neck 4 is provided with a lining 7 consisting of any suitable plastisol sealing compound. The lining is of non-uniform thickness and extends across the crown 1 and partly down the sides of the skirt and has the part 8 thereof which is of greatest thickness disposed in the region of the junction of the crown with the skirt.

Figs. 2 and 3 illustrate the manner in which the mouth of the bottle is closed and sealed by the cap using a known kind of capping machine a part of which is illustrated in Fig. 5. Bottles to be capped are moved in succession in the direction of arrow A, Fig. 5, to be received by a rotatable dial, not shown, for movement over a support, also not shown, for the bottle. The caps are delivered to the bottles by apparatus described below and during movement of the bottles by the dial are engaged by a sealing head 10, Figs. 2 and 3, which, in known manner, is arranged to be reciprocated into and out of engagement with a closure cap which has been loosely applied to the neck of a bottle, Fig. 2.

The bottle neck ring 11 has a maximum and a minimum manufacturing tolerance of the order of  $\pm 0.15$  inch and the internal diameter of the second portion 5 of the skirt is not less than the maximum permissible diameter of the neck ring 11, the gap provided being occupied by the lining compound. For purposes of illustration the portion 5 in Fig. 2 has been shown as of slightly greater diameter than that of the neck ring 11 to show the compound placement. Thus when pressure is applied to the top corner of the crown of the cap the diameter of portion 5 and the thickness of the sealing compound being the same for all caps, the sealing compound ensures a tight fit on a neck ring 11 with minimum diameter and a tighter fit on a neck ring with maximum diameter. The tapered root 12, Fig. 1, of the flute or knurling 6 acts as a lead in for the neck ring 11.

While pressure is applied to the crown the part 8 of the sealing compound is caused to spread to form side seals 14, 15, Fig. 3, with the outer and top faces of the mouth end of the neck 4 and when the seals have been formed the first portion 2 of the skirt is deformed to effect mechanical

nical interengagement thereof with the screw-threaded portion 3 of the neck 4. This step is performed, in known manner, by the use of a spinning roller or rollers 16, Fig. 3. The exterior form of the cap following the complete application thereof to the neck 4 is illustrated in Fig. 4.

It has been found that the problem of venting during pasteurisation can be overcome if the cap is pre-heated, before application to a container, to a temperature below that of the melting point of the plastisol sealing compound but in excess of that at which the pack is to be pasteurised. Pre-heating the cap to a temperature within the range of 5° to 25°C in excess of the temperature of pasteurisation has been found to be satisfactory. For example if the temperature of pasteurisation is 60°C it has been found satisfactory to pre-heat the cap to a temperature of from 65° to 85°C. The reason for this is thought to be that the pre-heating of the cap softens the plastisol sealing compound sufficiently to cause it, when pressed on to the neck 4, to flow and fill any small irregularities which may be present in the neck 4 and which would not be filled by cold-flowing of the compound thus leaving minute passages through which venting could occur during pasteurising.

Fig. 5 illustrates an apparatus which is arranged to be fitted to any known kind of capping machine and which will deliver caps in succession to the position B, Fig. 5, at which each cap is loosely applied about the mouth of a container. The apparatus comprises a chute 17 which is associated with a channel 18 which is connected to a hopper, not shown, and is arranged to receive caps one at a time from the hopper for delivery, by gravity, to the position B at which a cap passes from the chute and is loosely applied about the mouth of the container to be secured thereto as described above. Heater means are provided to heat the channel 18 and chute 17 to an extent such that a cap delivered to a container at position B is heated to a temperature below the melting point of the plastisol sealing compound but in excess of that at which the pack is to be pasteurised. As illustrated in Fig. 5 the heater means comprises an electrical heater element 19 which extends lengthwise of the chute 17 from the position at which caps enter the chute to the position at which the caps leave the chute, and an electrically heated tape 20 which is wound around the channel 18 and extends lengthwise of the chute 17 to the position 21 thereof at which a cap leaves the chute for application to a container. The apparatus includes a regulator 22 which can be manipulated to regulate the temperature to which sealing compound in the caps is heated, and a thermo-

meter 23 which is so located relative to the channel 18 and the chute 17 as to permit visual verification of the temperature to which said heating is effected. Capped containers leave the machine in the direction of arrow C, Fig. 5. The heater means has been specifically described as an electrical form of heater means but it is to be understood that other forms of heater means may be used, such as hot air or other gas, or steam.

#### WHAT WE CLAIM IS:—

1. A process for closing and sealing for pasteurisation a pack including a container such as a bottle or jar having a screw-threaded or beaded portion adjacent to the mouth thereof, and a cap which is made of permanently deformable material and comprises a crown and an annular skirt, and within the cap a plastisol sealing compound arranged to be engageable with and around the mouth of the container, said process comprising the steps of:—

- (a) heating the plastisol sealing compound in the cap to a temperature below the melting point of the plastisol sealing compound but in excess of the temperature at which the pack is to be pasteurised by feeding the cap through a chute heated lengthwise thereof to or substantially to the position at which the cap leaves the chute,
- (b) allowing the heated cap to pass from the chute and to be loosely applied about the mouth of the container,
- (c) causing the heated plastisol sealing compound to form seals with the outer and top faces of the mouth end of the container by applying pressure to the crown of the loosely applied cap, and
- (d) deforming the skirt of the cap to effect mechanical engagement of the cap with the screw-threaded or beaded portion of the container.

2. The process according to Claim 1, wherein the sealing compound is heated to a temperature within the range of 5° to 25°C in excess of the temperature of pasteurisation.

3. A pack closed and sealed by the process according to Claim 1 or Claim 2.

4. Apparatus for closing and sealing for pasteurisation packs each including a container such as a bottle or jar having a screw-threaded or beaded portion adjacent to the mouth thereof, and a cap which is made of permanently deformable material and comprises a crown and an annular skirt, and within the cap a plastisol sealing compound arranged to be engageable with and around the mouth of the container, said apparatus comprising

- (a) a chute arranged to deliver caps one

- at a time to a position at which they pass from the chute and are loosely applied about the mouths of the containers,
- 5 (b) a channel arranged to deliver the caps to the chute from a hopper,
- (c) heater means which extend lengthwise of the chute from the position at which the caps enter the chute to the position at which the caps leave the chute and which are arranged to heat the chute to an extent such that when the caps leave the chute the plastisol sealing compound in the
- 10 caps is heated to a temperature which is below the melting point of the compound but is in excess of that at which the packs are to be pasteurised,
- 15 (d) means operable to apply pressure to the crows of the caps loosely applied to containers thereby to cause the heated compound in the caps to form seals with the outer and top faces of the mouths of the containers, and
- 20 (e) means operable to deform the skirts of the caps applied to the containers to effect mechanical engagement of the skirts with the screw-threaded or beaded portions of the containers.
5. Apparatus according to Claim 4, including a heat regulator to regulate the temperature to which sealing compound in the caps is heated.
6. Apparatus according to Claim 4 or 35 Claim 5, wherein the heater means includes an electrically heated tape which extends lengthwise of the chute to or substantially to the position thereof at which a cap leaves the chute for application to a container.
7. Apparatus according to any one of Claims 4 to 6, including a thermometer so located relative to the channel and chute as to permit visual verification of the temperature to which sealing compound in the
- 40 caps is being heated.
8. Apparatus according to Claim 4 substantially as herein described with reference to the accompanying drawings.
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